The Interesting Story of PARACHUTES

HOW THEY WORK
HOW THEY ARE MADE
HOW THEY ARE USED
FOR PEACETIME AND
MILITARY PURPOSES

by

Captain Roger Don Rae

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RELIANCE MANUFACTURING COMPANY

Captain Roger Don Rae

● Captain Rae, for seven consecutive years winner of the National Parachute Jumping Championship, is outstanding both in experience and achievement in the parachute field. His career began when in 1927 he made his first jumps at county fairs. In addition to his unequalled record of success as parachute jumping champion, Captain Rae also won the Freddie Lund trophy for precision acrobatic flying, awarded at Miami in 1934 and 1935; and in addition, he took the "N.A.A. Champion Racing Pilot" award in 1936. In 1937 Captain Rae joined TWA and is today skippering one of their great transports between Chicago and New York.

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How Did Parachuting Begin?

● Since time began, man has tried to defy the law of gravity. Greek mythology gives the tale of Icarus and Daedalus. These two attached feathered wings to their bodies with wax and thus almost whipped gravity when the sun melted the wax and undid their good work.

Our first record of a parachute leading to the modern type appears in 1783. Sebastien LeNormand in that year put his dog in a basket, attached basket and dog to a form of parachute and threw the whole assembly from a tower. In 1793 Sebastien made the jump himself.

In 1797 Garmerin made the first descent from a balloon in a parachute. However, his crude chute, he recorded, had a mean tendency of whirling at a dangerous speed during the descent.

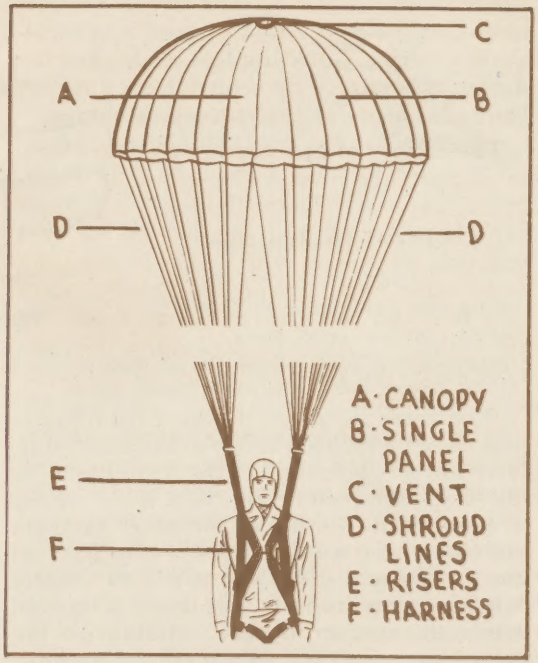
No one tried to im-

prove much on the earliest crude designs until Cockling in England used a conical-shaped device. Cockling lost his life but his design was copied by John Wise, an American who made several successful jumps.

The history of parachuting contains little of importance until 1878 when, in California, Captain Thomas Baldwin, a balloon expert, perfected and jumped in the first practical parachute with a vent in the peak —the same basic design used today. Captain Baldwin made many jumps from hot air balloons. After he had done this, ex-exhibition jumps rapidly spread throughout the world.

It is interesting to note, however, that the airplane had long been developed and in use before parachutes were made a part of standard airplane equipment, in spite of the fact that the two existed side by side. Not until 1912 did a Captain Berry make the first jump from an airplane. This feat was performed at St. Louis, Missouri, with the chute contained in a cylindrical tube attached to a wing skid.

During the last days of the World War German aviators started using these big umbrellas when forced to abandon ship. In the last days of the World War I and in the months immediately following, the United States and Great Britain made experiments with many types of parachutes. In 1918 the United States adopted the seat-pack type and made it standard equipment in 1919. More than 1500 jumps were necessary before a product suitable for military use was adopted.

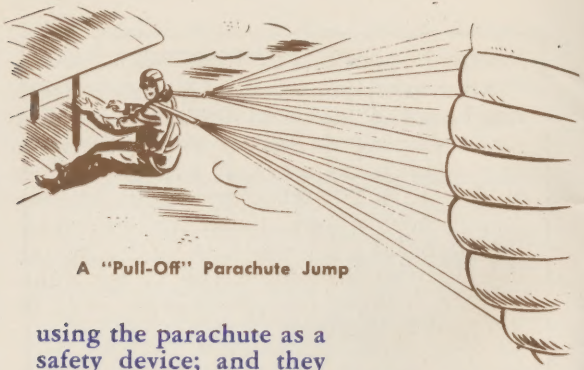


A Parachute As We Know It Today

This drawing shows the principal elements of a parachute, when opened. The canopy, made up of 24 panels, is attached to the harness by the shroud lines. These lines, fastened in groups of six to the riser straps, run from riser, up over the canopy, down to the opposite riser. Vent at top regulates release of air.

How Stunting Helped Develop Parachutes

Stunt parachuting and exhibition jumps played a great part in the development of parachutes. The "stunters" were jumping years before the air corps had any idea of

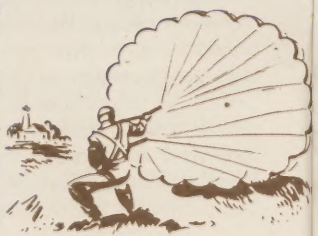


A "Pull-Off" Parachute Jump

using the parachute as a safety device; and they were developing many techniques which saved many later jumpers much grief.

The army got many pointers from jumping shows which are today of extreme value. The stunters worked out the techniques for directing the path of the chute which today are standard. Similarly, the stunt jumpers developed the ways to leave a ship (or bail out). The pull-off (first used) is exactly what its name implies. The chute is opened while the jumper is still standing on the wing. He is literally pulled off the plane.

Another technique is that of jumping or diving from the cockpit, taking a count of three to be sure of clearing before pulling the rip cord which opens the chute. The stunt jumpers learned by painful experience that the swing of the jumper must be stopped, otherwise he will make contact on the down-swing and suffer extreme injury. The stunt jumpers learned, too, never to face the wind or be dragged on their backs over rough ground.



After many jumps, these birdmen developed a set of "do's and don'ts" which have made jumping a casual experience. Broken ankles taught them to land with their knees slightly bent. Scratched and bruised bodies taught them to "spill the chute" after landing by pulling the top lines and allowing the air to escape, for if this is not done, there is danger that the jumper will be dragged by the wind.

Parachute Use By the Russians and Germans

World War II has led to great use of the parachute as an offensive weapon. Heretofore, armies have used it only in saving aviators' lives in combat. Today, in spite of the spectacular things that have already been accomplished, we still do not know just how great an offensive weapon it may prove to be; its possibilities are still enormous.

"Clouds of Fighters"

The Russians are credited with having done the most toward the development of parachute troops. Before the outbreak of the present war there were accounts of mass parachute jumps which at the time were scoffed at in many quarters as impractical. Nonetheless, in 1939, during

the Russo-Finnish war, Russia employed the parachute troops and dropped supplies on the front where surface transportation was impossible. The Russians in their war games have been known to drop as many as five thousand troops at one time.

The German army has also shown the potentialities of parachute troops as an offensive weapon. Their conquest of Poland and Norway employed the parachutes to transport troops and supplies on a huge scale. Without this use of parachutes the overrunning of Norway certainly, in such a short time, would have been doubtful.

Again, when British and Greek troops were well entrenched in Crete, with the British fleet holding mastery of the waters around the island, air-borne troops and supplies were the deciding factors in the capture of the island and the defeat of its defenders. Britain's fleet was helpless against a terrific air assault, while air-borne troops descended to neutralize vital points of defense. All too clearly was the striking power of such a force displayed.

Parachute Use in Fighting Forest Fires

In the last few years the United States Department of Agriculture has adopted the parachute as a means of combatting forest fires. The annual loss of acreage in the past is equal to the square mileage of the State of Arkansas. One can imagine the great waste of timber such fires cause.

Due to the heavy equipment which must be used, and the rugged terrain over which fire-fighters must work, these "fire chutes" are larger than standard. They have 30-foot "elevators" which let them down more slowly. At the first signal of smoke a waiting ship takes off with all equipment and men for the job. After the deep-woods firemen have taken note of the location of the fire, the wind direction, and likely places for landing, a kit is dropped containing axes, matches, shovel, rations, a small portable radio, and other necessities. Then, the fighters take to their own "umbrellas" and can quickly land near the scene of action. Many fires can be quenched in this way before large areas can be affected. If time were consumed in reaching a fire by pack train, great loss would result from the delay.

Parachutes In the United States Air Corps

Since the adoption of parachutes as standard equipment, it has been a rule that all persons riding in military planes be equipped with one. The pilots usually have the seat-pack type which they sit on and use as a cushion. Breast-pack and back-pack types (the other types most commonly used in the army) are used for passengers. The breast-pack can be laid aside and quickly collected when an emergency arises. Aerial photographers, machine gunners and observers make use of these since their jobs

often require moving around in the plane and the seat-pack would be too cumbersome for them.

The back-pack type may be used by bombardiers since they can use it also as a back rest. The back-packs stay attached but allow more freedom than the seat-pack type.

United States Parachute Troops

This brings us down to the latest development in our army—the "paratroops" or winged infantry. We have a special training center at Fort Benning, Georgia, for paratroops. All volunteers for this service must undergo a rigid examination. The applicant (of which there have been twenty thousand or more) must be under thirty, unmarried, and physically a "ripsnorter."

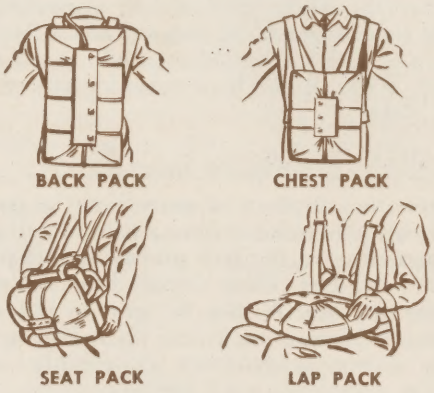
The training period is most rigid. What with rolls, somersaults, leaps from platforms, knocks and bangs, it is small wonder that there are "washouts" (eliminations). After weeks of this hardening period, trainees are given some jumps in a captive chute similar to those seen around carnivals. This allays fear of falling and soon the men are mentally conditioned for the first jump from a plane.

"The First Jump Is Easy"

In making these jumps during training the men always wear a second chute as a safety measure; but it is rarely, if ever, used. The transport from which the jumps are made must slow down to around 100 miles an hour. Otherwise, the terrific jerk with which the chute opens might cause injuries. Each jumper has his rip cord—the opening device—hooked on a cable in the plane so that there is no chance of its not being pulled.

Prior to any jump, each man must learn to pack and fold his own chute. This builds up his confidence since he sees and understands how the chute functions and the mystery and uncertainty are removed

The Types of Parachutes:



OTHER TYPES ARE CHAIR PACK AND FORM-FITTING BACK-PACK—NOT ILLUSTRATED

A New Invention to Pre-Prove Parachute Safety and Workmanship *Reliance engineers invented this new kind of inspection table for examining seams. By lighting seams from below, even the tiniest flaws in stitching can be detected and corrected at once.*

from his mind.

A man coming down in a parachute reaches a rate of descent from 16 to 24 feet per second, landing with a jolt equal to that from leaping off a 12-foot wall. The novice jumper learns the rules: "Land with slightly bent knees—just before reaching the ground, haul up on the riser straps—hit with a roll when in a swing—'spill the chute' to stop the drag."

Jumps may be made from a point as low as 150 feet but it is not considered safe unless the plane is more than 250 feet above the ground. The average is about 1,000 feet for men in training. Since these jumps are premeditated, the members of the parachute corps are not eligible to become members of the famous "Caterpillar Club."

Care that the straps or harness fit snugly must be exercised, for many jumpers have learned in a painful way that loose straps can inflict biting cuts.

The parachute corps meantime is daily growing and soon we will have many battalions of them. It is expected that these hard-driving units will form a vital link in the employment of our armed forces. The paratroops' striking power is limited only to the speed of the transports carrying them. One can imagine what destruction a company of these fully armed air infantry could do to a power plant, a railroad center, a water system, or an undefended city.

"Bend Your Knees!—Haul On the Riser Straps"

The Parachute As a Weather Observer

For many years past we have all heard of weather flights, made in the early morning to collect weather data for meteorologists. These flights were often hazardous since the climb up to 15,000 feet had to be made rain or shine, in ice or snow. The most dangerous foes of the airplane are thunderstorms and ice. These dangerous risks are now unnecessary, thanks to the parachute.

The Flying Weatherman

A rubber balloon is sent aloft with a radio and a tiny chute attached. As the balloon rises, the radio impulses are constantly being transmitted to keen observers below. As rarefied air is reached, the balloon bursts, the parachute opens and gently descents, allowing its "weather man" to complete his report. From the radio impulses the Weather Bureau can determine the wind above, temperature and dew-point, icing conditions, the tops of overcast, and other data so vital to modern flying. Here we see the parachute doing its part to make flying safe and sure, for without this information flying would be retarded.

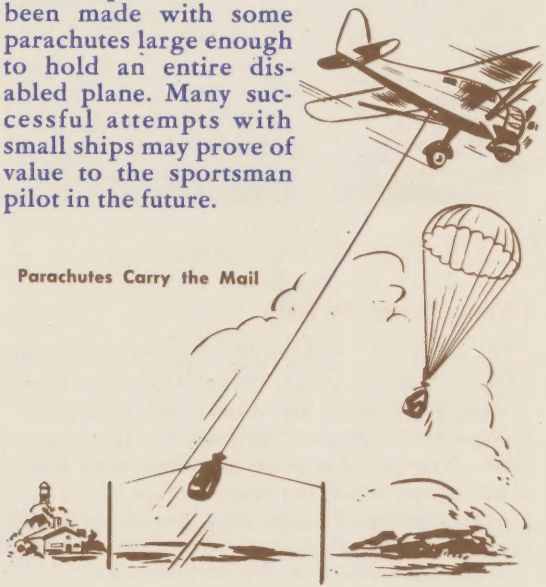
Parachutes and the Mail

The parachute has been recently adopted by Uncle Sam's Post Office Department.

Mail pick-up service in towns that do not have airports is an ever expanding operation. Now we have the mailman who flies over, drops mail, express, and produce in a parachute, and snags outgoing mail with his hook in one swoop.

Pick-up planes meet the large transcontinental flights and get the assigned mail for the smaller towns. As they drop a sack off in one of the smaller centers, they in turn get an outgoing sack with their hooks. The hook is let down on a steel cable by means of a winch. Mail to be picked up is on a line between two poles. As the plane flies between and above these poles the hook snares the sack and the winch picks it up. The mail is then sorted and is all ready to go east, west, north, or south when the pick-up ship gets back to the big terminal. Soon this system should envelope the entire country as it is proving effective.

As a sidelight it might be mentioned that some experiments have been made with some parachutes large enough to hold an entire disabled plane. Many successful attempts with small ships may prove of value to the sportsman pilot in the future.

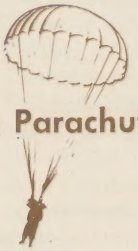


Parachutes Carry the Mail

Parachute Flare

The parachute flare is a device for lighting at night. All army, navy, and airline ships are equipped with them. The canopy or umbrella part is about the size of a standard umbrella with lines attached to the flare proper. As the chute is released, the chemical in the flare is scratched which causes it to ignite much like a kitchen match. There are several different flares, all of which burn for a prescribed length of time.

The parachute flare is used a great deal in military operations to light up an enemy's position. In commercial flying they are used to effect a landing at night where there are no other lights. In war games the army has landed whole squadrons of airplanes with no other light except the parachute flares.



Some True Parachute Stories

No doubt, if all the thrilling stories of parachute jumps and unusual ways in which parachutes have been used were told, they would fill volumes. However, there are a few which stick in my mind which I would like to pass on to you.

In the middle '30's a tribe of Indians in the region northwest of Winslow, Arizona, were out with their flocks making ready for the oncoming winter. Without warning, a heavy snowstorm set in, catching the whole tribe not only unprepared, but miles away from camp. Being Indians, they were able to make a shelter for themselves, even though their sheep did perish or were lost in the storm. However, starvation seemed unavoidable as travel was impossible in the

A Final Double Check *Despite constant inspection during manufacture, we re-check again, on the finished chute. Here the inspectors are going over a chute, hung up. Note the height of the chute.*

deep snowdrifts. One day a Transcontinental & Western Airlines skyliner, on its route near Grand Canyon, passed near enough to notice a sort of smoke signal the Indians were sending. Captain John Graves circled his big ship low enough to realize the predicament the band was in. When he landed at Winslow, the news soon spread and supplies were quickly gathered. Many bundles of clothing and food were loaded, among which were canned beans. The ship wasted no time and took off immediately on its errand of mercy. One can imagine the relief the Indians felt when the big ship roared over their heads and a big, white umbrella came floating down to them. If there was any warwhoop left in them, I am sure they gave it.

Enough supplies were parachuted to give the tribe as much, and more, comfort than they would have had at home in their own hogans. After the thaw, when the Indians reached their camp, Captain Graves was made a chief with full tribal ceremonies, and presented the title, "Chief Flying Beans."

"Chief Flying Beans"

Not once, but many times, has the parachute been used to bring aid in times of much distress. During the great Mississippi River floods, supplies and medicine were lowered by parachute in isolated places. All the commercial airlines took part in this relief.

Another story that stands out clearly is the case of a young lieutenant in the Islands. He was flying his twin-engined bomber on a routine mission when for some reason unknown his ship caught fire. Seeing it was impossible to land, he gave the command to his crew of five to abandon ship. As the fire was spreading and gaining in intensity, they needed no second order, each man in turn bailed out, all the while the lieutenant was holding his ship on an even keel and losing altitude in keeping his flying speed. By the time the last of his crew was safely floating down in his chute, the flames and smoke were so thick that the pilot was flying solely by instrument. When he was sure all were clear, he opened the hatch and dived from the flaming inferno.

Help for Flood Victims

In gliding his ship, he had descended dangerously low for a jump, and his chute

had time only to string out behind. The gods of luck smiled on him that day, for instead of being dashed to pieces, his silken saviour just wrapped itself about the cable extending from a water tank. On the backswing the lieutenant suffered a severe jolt against the tank structure. However, the chute saved his life in a highly unorthodox way, and today he is a captain on one of our major commercial airlines.

"And the Trophy Was Won"

What promised to be a fatal mishap was seen at one of our national air races. It was rather a bad day for the spot jumping contest as a strong southwesterly wind was blowing. Nevertheless, the boys were at it, even though they were missing the spot by an unusually wide margin. The interest of the crowd picked up, however, when they noticed that the next jumper had started to slip his chute dangerously. In his eagerness to make his glide path toward the designated spot, he was climbing half way up the shroud lines and suddenly the wind spilled out and he came plummeting downward. The crowd watched with baited breath as the twisting form fought to untangle the lines. Just as it seemed that the contestant would crash to the earth, the lines freed and the parachute filled out in time to check the fall, and the jumper won the contest.

However, off the record, while there was a tremendous thrill in winning that trophy, I wonder to this day if it was worth the jar and the scare it cost. I was that parachutist.

Probably the greatest jump of all time was that recently made at Chicago. There have been many, 10,000-foot delayed jumps. I, myself, have made five of them. Some also have been made from 15,000 feet, but never before has the jumper started from the stratosphere.

Equipped with heavy flying clothing, oxygen equipment, goggles, altimeter, and other accessories, the daring experimenter had his pilot take him up as high as the plane would climb. After the plane had reached a spot above 30,000 feet, roughly six miles up, he was ready to jump. Oxygen was being used all the time the plane was above 15,000 feet since the rarefied air above that point would soon befuddle any human being, in fact, death would take place if sustained flight without oxygen were attempted above 20,000 feet.

Well we may wonder what was passing through the parachutist's mind as he looked

down through the purple haze to the earth far below. It took courage to leave that plane when he did. Down, down, down he came—the winds roaring in his ears—twisting and turning. All the time he watched the altimeter strapped to his wrist. Passing through a layer of moist air, his goggles suddenly iced up. That was a most anxious moment. He could not see the altimeter. To remove his goggles and expose his eyes to a blinding gush of air might be just as annoying—or just as fatal. No doubt at that moment he was tempted to open his chute. Yet, if he should pull the rip cord then, his research would be void. He planned to open his chute at about 1500 feet. That in itself is a dangerous wait, since the lag in the altimeter is not always calculable. By peering out from a partly raised goggle he was able to check his altimeter. What must have seemed hours to him was only a minute or so when warm air de-iced his lenses. The climax for him was passed.

To the craning crowd below his parachute opened none too soon. He floated to earth—the man who had made other jumps elementary.

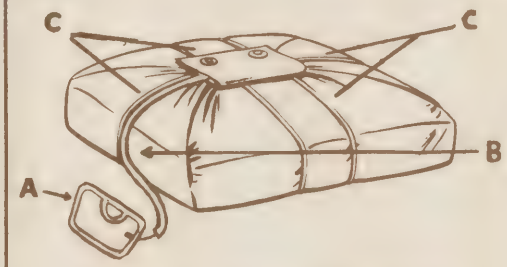
This jump will have much to offer to science. One of the main facts established is that a man does not die or lose his senses in a fall.

This Dummy Makes the Drop Test:

The dummy is made the size and weight of an average man. He puts the final "seal of approval" on the chute by riding down from 500 feet in it.

How Parachutes Are Constructed

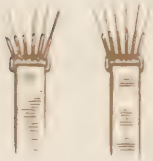
We shall try briefly to give you a picture of how these big mushrooms are made. As I have said before, the three main types of parachutes for jumpers are the seat-pack,



How the Packed Chute Opens

This is the process in a rip cord-opening chute; Chutist pulls rip cord ring "A." Cord, running through cable "B" opens flaps "C." This releases the spring-loaded pilot chute which drags out and opens the main canopy.

The Pilot Chute



Risers—Strong Enough to Lift a Team of Horses

breast-pack, and back-pack types. There are other types such as the chair-pack, the lap-pack, and the form-fitting back-pack types. These are not as common as the former three. However, the forest firefighters like the lap-pack type along with the breast-pack—these are their two preferences.

Parachutes are made with the "skirt" in three different sizes with diameters of 22 feet, 24 feet, and 28 feet. In the air corps the standard size is the 24-footer. For heavier men and bulky equipment the 28-foot size has proven best, while the 22-footer is used as a second chute, for exhibitionists and for novice jumpers in training.

The canopy, or umbrella-shaped part, is made of pure raw silk. Raw silk is the preferable material because it is not easily creased when packed. Some chutes have also been made of rayon and nylon. However, raw silk remains the principal material.

The canopy is put together in panels cut and sewed on the bias, while at each seam or joint a shroud line, running from one side of the chute to the other, is fastened. Each of these lines has a tensile strength of more than 450 pounds. These shroud lines may be likened to the ribs in the umbrella except that they continue down below the chute and are attached to the lift webbing. This lift webbing has a tensile strength of 3,000 pounds and is doubled throughout the harness and straps. The body and leg straps are made of the same material. The riser straps are hooked so the strain on the pilot is felt on the legs and seat. When packed, the chute is about the size of a sofa pillow and weighs about 20 pounds. The container or pack is made of heavy canvas. It requires from one and a half to two seconds for the parachute to open and the better part of an hour to repack it.

All military pilots and jumpers, as well as commercial jumpers, are thoroughly familiar with how to pack a chute. Each panel with its corresponding lines is carefully straightened and tucked into the container to avoid fouling when opened.

To open a chute, a jumper pulls the rip cord. This loosens a flap releasing a pilot chute about three feet in diameter. This pilot chute which is, as they say, "spring loaded," is automatically opened by a powerful spider-like spring and serves to drag the main canopy out straight and smooth with the help of the air. The parachute will open without the aid of the pilot chute. However, this small helper expedites operation.

At the apex where the pilot chute is attached is a hole elastically bound, called the vent. When the parachute first fills, the

Ready to Take Off With "Elmer"

Elmer, the test dummy, goes aloft many times a day, each time with a new chute to test, as Reliance's Washington, Indiana factory pours out more and more parachutes for Uncle Sam's fighters of the air.

vent will expand, letting the air escape and lessening the jar on the jumper. It must be remembered that a man falling swiftly receives quite a healthy jolt when the parachute checks his fall, hence, this precaution to reduce this jolt as much as possible. As the speed of the falling man is reduced, the vent contracts. This holds the air inside of the canopy and slows the descent.

Naturally, each parachute is given the most careful kind of inspection for stitching and quality of material. To test a chute, a dummy about the size and weight of a man gets a thorough work-out. Since the dummy does not bruise easily, his job is to give the final okay by making the descent in each chute. In the air posts a record is kept on each parachute. It is periodically dropped, hung up to dry, and repacked.

There is a special department whose sole job is the care, inspection, and maintenance of parachutes. Great care is exercised by them to keep water, oil, acid, or any other foreign matter from getting inside of the pack. Even the temperature in storage is carefully watched for fear of condensation, causing moisture. Since lives depend on its proper functioning, the certainty that the parachute will open and will support a man safely down to earth is not left to guesswork.

★ ★ ★

THIS INTERESTING STORY OF PARACHUTES IS PRESENTED WITH THE COMPLIMENTS OF RELIANCE MANUFACTURING COMPANY

CHICAGO, ILLINOIS

Makers of

PARACHUTES for Pilots and Machine Gunners

PARACHUTES for Paratroops

AERIAL DELIVERY PARACHUTES (for Army Aid)

AIR MECHANICS' SUITS

FATIGUE UNIFORMS for Soldiers

ARMY PANTS AND SHIRTS

NAVY WHITE JUMPERS AND TROUSERS

NAVY WORK SHIRTS

ARMY UNDERWEAR SHORTS

Reliance SERVES AMERICA

The skill and care that today go into the making of parachutes and mechanics' suits, fatigue uniforms and jumpers, were learned *by Reliance workers making clothes for you. And that same skill and care go into the Reliance products you buy —for we believe we are also serving America, when we supply "the home folks" with comfortable, long-wearing garments at money-saving prices!*

FAMOUS BIG YANK GARMENTS

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Dress-clothes quality and workmanship with work clothing wear! Only BIG YANK gives you all these features: Patented "Elbow-Action" sleeves; Diamond-Wear buttons; patented cigarette pocket; patented strain-proof yoke; tailored collar; patented No-Tare pants pockets. Wide range of colors.

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Big Yank NO-TARE Fly Shorts and Athletic Union Suits

The only shorts with the patented NO-TARE fly construction that won't tear or rip. Another BIG YANK exclusive feature, to add long comfortable wear, to the best-looking, non-riding, full-cut shorts you've ever worn. All waistband sizes.

ON THE HOME FRONT, TOO!

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Glenbury and Hampton Hall Dresses—With more style features than ever, for that "prettiest look, all day and every day." Their wonderful wear makes them practical for "around the house"; yet they're styled for an afternoon's bridge entertaining.

Kay Whitney Classics—Styled with the "classic" feeling that makes them acceptable anywhere any time. In the smartest, best cotton and rayons — smartly styled, yet moderately priced.

In Addition—*Reliance makes the famous Jeep Suit for women—the ideal work slack suit for around the house, working in the garden, or for work-wear in industry.*

UNIVERSAL Puts the World To Sleep! . . . In Sleepwear That's STYLED RIGHT

Cut for both style and sleep-comfort! Include button and slip-over styles in men's pajamas, in plain colors and patterns. Pajamas and nightgowns for women in broadcloth and flannelettes. Look for the Universal label, for utmost sleepwear value.

Nite-Tog and Rest-Rite—Pajamas for men — add another range of styles and patterns to famous UNIVERSALS! Look for these pajama brands too — you'll be sure of "comfortable-sleeping" nightwear.

Ensenada — America's No. 1 Sports Wear For Comfort And Attractive Style

Here are America's Number One Fun Suits — for men, women, boys and girls. Complete your wardrobe with an Ensenada suit or two — for golf and tennis; for hikes, beach trips and picnics, or for just plain "taking it easy." Big selection of colors and materials, in long or short sleeves. Women's Ensenadas are made in a dozen smart styles and fabrics. Children love them — here's the fun-suit that looks grown-up! So — get Ensenada for the whole family.

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One of America's most famous names in men's shirts for dress wear — famous for top quality, workmanship and wear, at a dependable, moderate price.

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